Aardenburg
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IMAGING & ARCHIVES

Tested System:
ID#:220

Printer: HP Designjet Z3200 44”

Inks/Colorants: HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red)

Media: HP Pro Satin Photo Paper

Coating(s): no additional coating

Sample #: AaI_20101208_SN017

Testing Status: 140 Megalux hours total light exposure

Testing is complete - there are no more updates

Conservation Display Rating (CDR)

Lower limit: 31 Megalux hours (for weakest 10% of the color patches)
Upper limit: 85 Megalux hours (for average of all the color patches)

Note: a CDR with narrow range (typically less than 2:1) indicates relatively even overall fading of the image. A wide range indicates faster fading in certain local colors/tones prior to general fading of most colors/tones in the entire image. Compare ratings for different systems directly and/or use the table on page 2 to estimate time (years) on display.

* Please read document AaI_2009_0118_TA-01.pdf, **“An Overview of the AaI&A Conservation Display Ratings”**, located on the Documents page of the AaI&A website for furhter explanation of the Conservation display ratings.

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About this Report

This report contains light fastness information about a sample test print produced by a specific digital printing system. "System" refers to all hardware, software, and materials used to make the finished print. The hardware, software, material components, and printmaker's skills contribute to the final image quality and image permanence. The tested sample is made with current or recently discontinued stocks of commercially available products unless otherwise stated. Each sample has been prepared by Aardenburg Imaging & Archives or one of its members in accordance with customary print making practices unless otherwise noted. The sample may also contain additional finishing materials such as overcoats and laminates which are also noted when used. Finally, the sample has been tested under standardized conditions that are defined on the Sample Description page (see page 4). AaI&A makes every effort to ensure but cannot guarantee that the samples are properly identified and documented and that test results are accurate. For this reason, AaI&A also strives to test independently produced sample replicates in order to increase sampling confidence and to provide information on process variability. Please compare the results in this report to replicate test samples when the data become available.

Understanding this Report



The magnitude and visual appearance of fading depends not only on the chosen printing system but the chosen image as well. In other words, different images are comprised of different colors, and the fading relationships between those colors dictate how the image will look as it fades. The sample print in this test report was made by reproducing the digital image shown on the left. It contains 30 standard colors. 24 of the colors are colorimetrically matched to the Macbeth ColorChecker™ chart viewed under D50 illumination. The remaining six colors supplement the ColorChecker™ array with four additional skin tone colors, one patch for paper white, and another for maximum black. The additional colors also round out the distribution of CIELAB L* (lightness) values in the test target.

Information about the fading characteristics of the product is provided in three ways:

1) You can visually assess the fading. The target images reproduced in this report are digitally reconstructed from the spectrally measured color data rather than scanning or otherwise reproducing the physical print by conventional techniques. This method ensures a colorimetrically accurate representation of the print appearance as the print fades. A calibrated monitor is recommended to experience the best possible reproduction of the test sample appearance. The side-by-side "before and after" presentation of the target images simulates looking at a perfect copy of the unexposed original print along side the same print after light exposure. You can also use Adobe Reader's full screen mode to cycle through the pages and "animate" the fading.

2) I* Color and tonal accuracy scores are reported. This report includes I* metric scores that compare the color and tonal relationships of the light exposed samples to the color and tonal relationships existing in the original print prior to light exposure. Perfect I* scores of 100% can be approached when no significant fading occurs. Average scores above 90% generally indicate excellent retention of original quality, 80% good, 70% fair, etc., but your conclusions may vary depending on your image quality requirements. I* color rates the retained color accuracy (hue and chroma) while I* tone rates the retained tonal accuracy (lightness and contrast). The score is on a percentile scale where 100% is a perfect match between the comparison image (e.g., "after" light exposure) and the reference image (e.g., "before" any light exposure). 0% I* color means no color accuracy is left. 0% I* tone means essentially no tonality remains and all image information content is lost. Negative I* values have significance as well and contribute to the average I* score when they occur. Negative I* color values mean false color has occurred, for example, when a skin tone turns green or a neutral gray becomes distinctly colorful. Negative I* tone scores mean visual contrast between colors has become inverted (i.e., like the tonal relationships in a photographic film negative). Serious image quality problems must arise before false colors and/or tones appear. For more information on the I* metric, please refer to the AaI&A web site.

3) Color changes are also reported using the classic color difference model, ΔE. Note that ΔE values lose perceptual scaling significance when they become large (e.g., > 15). Also, the ΔE equation does not unambiguously measure changes in image contrast. This limitation is generally not a problem for paints and textiles, but can be a serious oversight when evaluating photographic images. Properly tracking changes in image contrast was a major reason behind the development of the I* metric.

Table to Convert Megalux-hours of Light Exposure to estimated "Years on Display" Light Fastness Ratings.											
Indoor Light Levels for Print Display		Multiply Mlux-hrs by	Megalux-hours in test									
Light Exposure	**Description**		**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
≤ 10 Lux 24 hours per day	Interior rooms, storage areas, or hallways without windows, illuminated sparingly by artificial lighting	**11.42**	**114**	**228**	**342**	**457**	**571**	**685**	**799**	**913**	**1027**	**1142**
50 Lux 12 hours per day	"Museum Standard" display condition	**4.57**	**46**	**91**	**137**	**183**	**228**	**274**	**325**	**365**	**411**	**457**
120 Lux 12 hours per day "Kodak Display Years" (1)	Average home illumination level for photos is ~ 60 lux. 90% of all displayed photos do not exceed 120 lux (1).	**1.90**	**19**	**38**	**57**	**76**	**95**	**114**	**133**	**152**	**171**	**190**
228 Lux 12 hours per day	Relatively bright home or office. Note the simple 1:1 relationship between "years on display" and Mlux-hr values at this condition.	**1.00**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
450 Lux 12 hours per day "WIR Display Years" (2) Also equals 500 lux for 11.8 hours per day	A bright home or commercial office building illumination level is 200-500 lux. Also, good illumination for color critical viewing and color matching tasks begins at about 500 lux.	**0.51**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**41**	**46**	**51**
2000 Lux 12 hours per day	Commercial Gallery. Also, critical color evaluation standards call for 2000 lux and a D50 illumination source.	**0.114**	**1.1**	**2.3**	**3.4**	**4.6**	**5.7**	**6.8**	**8.0**	**9.1**	**10.3**	**11.4**
5000 Lux 12 hours per day	E.g., Sunlight through a window striking print at an angle.	**0.046**	**0.5**	**0.9**	**1.4**	**1.8**	**2.3**	**2.7**	**3.2**	**3.7**	**4.1**	**4.6**
10,000 Lux 12 hours per day	South-facing window in U.S.A. , e.g., storefront display with photos directly facing window.	**0.023**	**0.2**	**0.5**	**0.7**	**0.9**	**1.1**	**1.4**	**1.6**	**1.8**	**2.1**	**2.3**

Light levels commonly encountered in the real world fluctuate widely throughout indoor print display environments and produce large variations in how long it takes for artwork to acquire light-induced damage. Use this table as a guide to estimate how many "years on display" (denoted in red text) it takes to accumulate an equivalent light exposure dosage. Review the test results to decide which Megalux-hour dose has caused fading to your level of concern (e.g., just noticeable, easily noticeable, objectionable, etc.). Then choose the "Light Exposure" description that best represents how your print is likely to be displayed. You may want to obtain a lux meter and make some measurements in your own display environment!

Note that as the years of display time increase, light-induced fading can be eclipsed by other serious aging mechanisms such as fading and/or staining caused by heat, humidity, and air pollutants. Mould damage can also occur at high humidity. Even when colorants remain water fast, direct contact with liquids may result in physical deformation and staining of the substrate. Also, temperature and especially strong seasonal humidity fluctuations can cause physical cracks and/or flaking, etc., over time. Handling damage such as scratching, abrasion, tears and creases, and catastrophic damage by smoke, fire, flood, etc., also destroy print quality over time. Thus, as illumination levels are reduced other forms of print degradation take on greater probability of occurrence.

(1) Eastman Kodak cited this exposure condition with a 90% confidence limit as a rationale for estimating print fading times of traditional color photo materials in typical home display environments. However, for light fading claims regarding its line of pigment-based inkjet printers, Kodak adopted the higher level of 450lux/12 hours per day which is also used by Wilhelm Imaging Research, Inc. (See below).

(2) Wilhelm Imaging Research (WIR) standardized its light fastness ratings on 450 lux for 12 hours per day in order to estimate the years on display necessary to reach "easily noticeable" fading. This average daily light exposure dosage, at an assumed 75˚F/60%RH temperature and humidity level, has become a de facto industry standard for most industry-sponsored predictive "years of life" light fading estimates in the absence of a published International Standards Organization (ISO) test standard. The table above readily shows how much error occurs in such "print lifetime" predictions as actual real world light levels for prints on display routinely deviate above and below the assumed 450 lux intensity value.

Sample Description

Sample # **AaI_20101208_SN017** **Batch #:** K1
Printer: HP Designjet Z3200 44”
Ink: HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red)
Media: HP Pro Satin Photo Paper
Coating(s): no additional coating

Test Print Prepared by: AaI&A member
Printed: December 16, 2010
Initial Print colors measured August 10, 2011
Test Started: August 11, 2011

Test Image: AaI_StandardColorSet(v2)forSRGB.tif
RIP?Driver settings: HP driver on Windows XP using Qimage software, rendering resolution = 600ppi, printing resolution = 1200x1200, quality level = best, more passes, application managed colors, gloss enhancer “on”.
Media Setting n.a.

Profile: n.a. **Rendering** perceptual w/bpc
Profile type: custom

Paper White Color (UV-included versus UV-excluded)

Optical Brighteners Present? *yes (medium)*	**L***		**a***		**b***	
	UV inc	UV exc	UV inc	UV exc	UV inc	UV exc
Media Whitepoint Color	94.6	94.4	0.4	-0.4	-3.3	-0.8
	UV-inc/UV-exc ΔL*, Δa*, Δb* respectively					
	0.2		0.8		2.5	
	Calculated differences, especially for Δb, indicate the role and magnitude of fluorescence on original paper color*					
Maximum Printed Black	**L***	**a***	**b***	Optical Density (Dmax)		
	6.9	0.1	-0.9	2.12		

Light source: Phillips Colortone F40T12/C50 – 5000˚K full spectrum fluorescent. Color rendering Index (CRI) =92), soda lime glass filtered
Light Exposure Cycle: 8 hours on, 4 hours off, twice per 24 hours
CIELAB measurements: D50 2˚ observer, Xrite Gretag/Macbeth Spectrolino/Spectroscan

Average Illuminance during “on” cycle: **10906 Lux**
Average Temperature: 23.6˚C over full test duration, 25.0˚C during light exposure.
Average Relative humidity: 56.7%RH over full test duration, 56.3%RH during light exposure.

Notes/Comments:

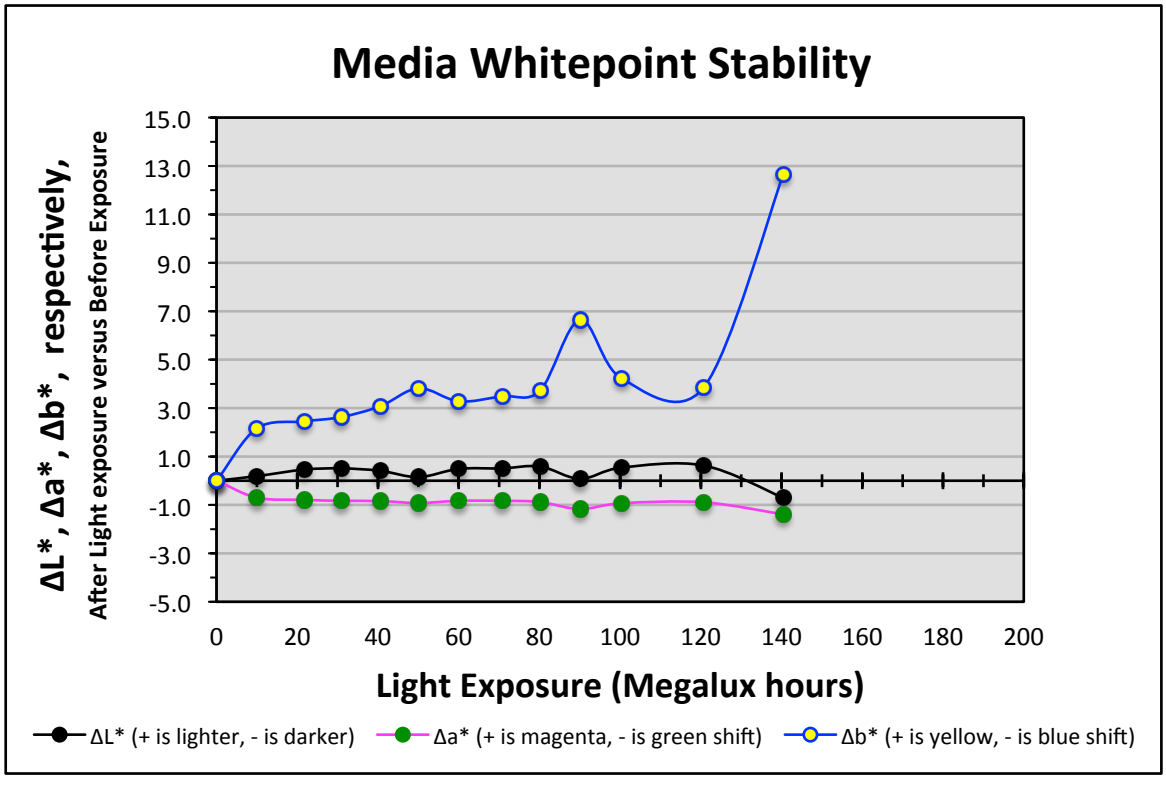
MHMG 2014-01-28: The dips in the graphs at 50 and 90 Mluxhrs and recovery at 60 and 100 Mluxhrs were not measurement errors. The 50 and 90 Mluxhr measurements were delayed a few weeks after removing the sample from the light fade unit. The temporary "dark storage" period caused a phenomenon I call "light-induced low intensity staining (LILIS). Additional media yellowing occurs which can be partially or fully reversed with more light exposure of sufficient intensity (as evidenced by the 60,100,and 120 exposure results), but the stain will return again with further storage in low intensity or dark storage environments. The LILIS behavior appears to be related to optical brighteners in the media, but more research is needed.

MHMG 2015-06-24: The 140 Mluxhr exposure dose marks a deliberate effort to induce the LILIS effect. The sample was not meausured immediately after removal from the light fade testing unit. Rather, the sample was placed in dark storage for a period of several months prior to taking the 140Mlux hour sample reading. The result of the additional dark storage time is a severe increase in media discoloration (ie., the LILIS effect). It affects all the highlight values and can even influence the color reproduction of midtone colors like "blue sky" patch number A3.

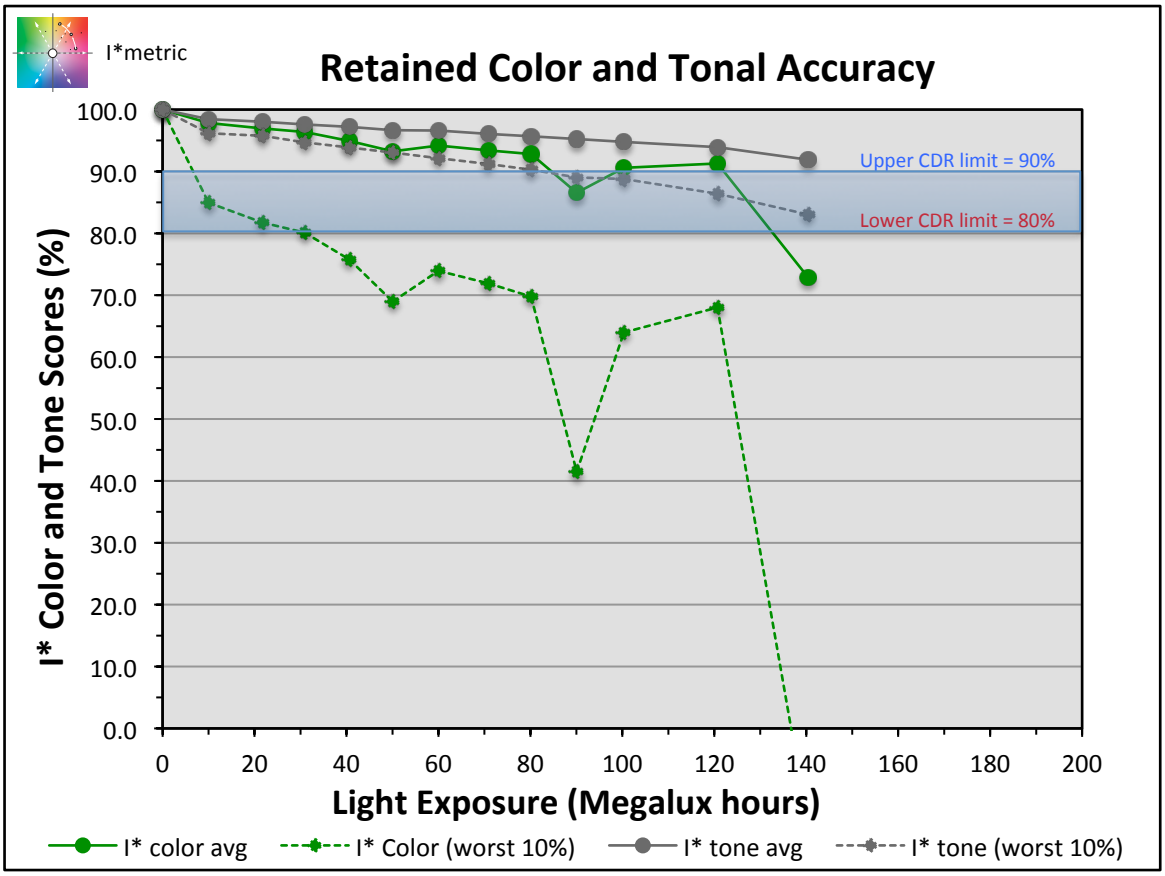
The HP Vivera pigmented inks are very lightfast. However, the paper's susceptibility to light induced discoloration severely compromises the overall performance of this printer/ink/media combination. This RC photo paper is therefore NOT RECOMMENDED FOR FINE ART APPLICATIONS where long term media color stability on and off display is essential.

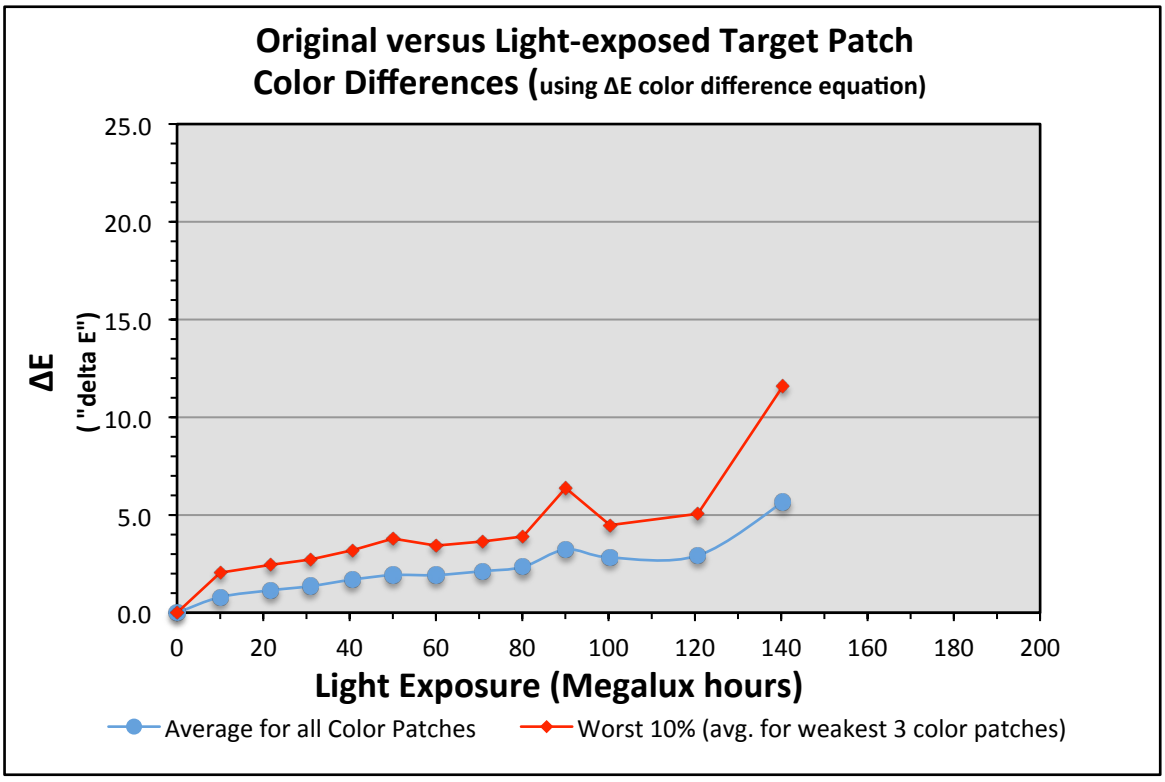
Graphs:

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



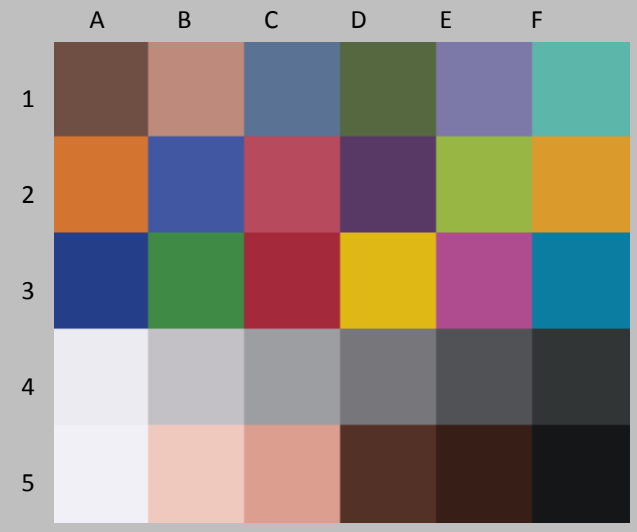
HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



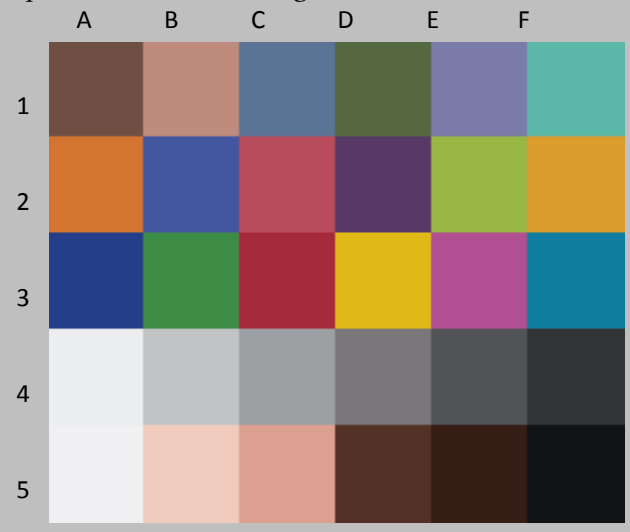


Values:

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure



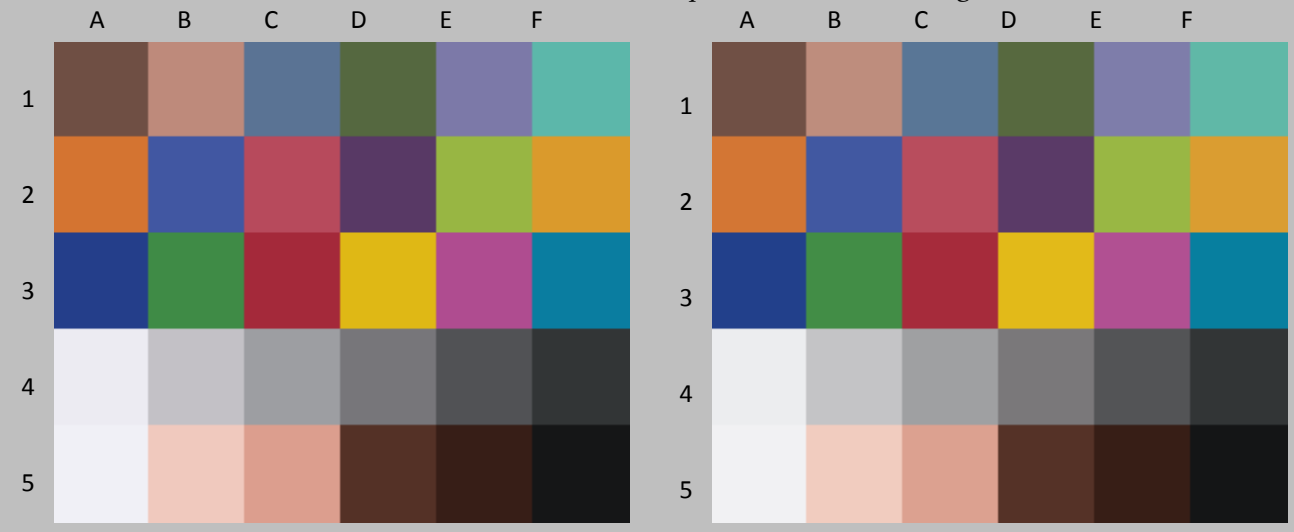
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	100.0	0.2	36.8	36.9	13.2	13.1	12.0	12.2
B1	Light Skin	98.9	0.9	62.4	62.8	19.1	18.6	15.6	16.3
C1	Blue sky	100.0	0.6	47.5	47.8	-3.1	-3.5	-21.4	-21.1
D1	Foliage	100.0	0.4	41.4	41.7	-12.8	-13.0	20.2	20.4
E1	blue flower	98.4	1.0	52.6	53.1	8.9	8.4	-25.4	-24.6
F1	bluish green	99.3	0.8	68.5	68.8	-31.1	-31.1	-1.5	-0.8
A1	orange	100.0	0.6	59.1	59.3	34.9	34.6	52.0	51.6
B2	purplish blue	100.0	0.5	38.0	38.2	10.0	9.7	-43.7	-43.5
C2	moderate red	99.5	0.9	46.9	47.4	46.0	45.6	13.4	14.0
D2	purple	100.0	0.3	28.8	29.2	21.4	21.5	-21.2	-21.1
E2	yellow green	100.0	0.4	70.1	70.4	-23.0	-23.0	53.0	53.3
F2	orange yellow	100.0	0.5	68.7	69.0	18.1	17.8	62.8	62.8
A3	blue	100.0	0.4	27.8	27.9	11.6	11.5	-45.8	-46.2
B3	green	100.0	0.6	51.8	52.1	-36.4	-36.6	29.3	29.7
C3	red	100.0	0.6	38.2	38.5	51.0	51.1	21.8	22.3
D3	yellow	100.0	0.5	76.7	77.0	5.2	4.9	74.5	74.8
E3	magenta	98.4	1.4	47.5	48.2	47.0	46.3	-18.5	-17.3
F3	cyan	99.8	0.6	48.1	48.4	-19.9	-20.3	-26.6	-26.3
A4	white	82.2	2.2	93.3	93.6	0.6	-0.1	-2.9	-0.8
B4	neutral 8	91.3	1.4	78.4	78.8	0.8	0.5	-2.3	-1.0
C4	neutral 6.5	97.6	0.8	65.2	65.6	0.3	0.1	-2.3	-1.6
D4	neutral 5	100.0	0.5	49.9	50.3	0.8	0.6	-1.8	-1.5
E4	neutral 3.5	100.0	0.2	35.1	35.2	0.2	0.1	-1.8	-1.7
F4	black	100.0	0.2	21.8	21.7	-0.6	-0.8	-1.0	-1.0
A5	paper white	81.4	2.3	94.7	94.9	0.6	-0.1	-3.5	-1.3
B5	Skin highlight L*=88	93.3	1.7	84.4	84.7	13.3	12.5	10.5	11.9
C5	Skin highlight L* =75	97.8	1.2	70.9	71.3	21.5	21.0	17.5	18.5
D5	Skin shadow L*=28	100.0	0.2	24.7	24.9	14.9	15.0	14.1	14.3
E5	Skin shadow L*=13	97.4	1.0	14.4	14.0	11.9	12.4	10.4	11.2
F5	Maximum Black	100.0	1.0	6.9	5.9	0.1	-0.1	-0.9	-0.9

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	97.8	98.5	0.8
Worst 10% (3 lowest scoring patches)	85.0	96.2	2.0

10 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

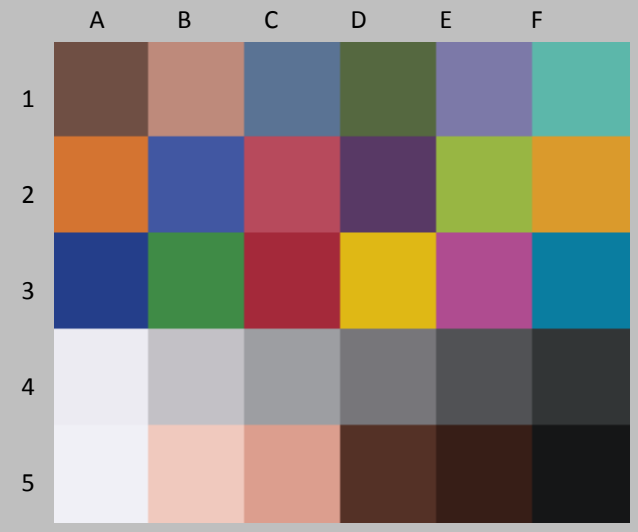
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	100.0	0.5	36.8	37.2	13.2	12.8	12.0	12.2
B1	Light Skin	97.8	1.2	62.4	63.0	19.1	18.3	15.6	16.3
C1	Blue sky	98.2	1.2	47.5	48.2	-3.1	-3.6	-21.4	-20.7
D1	Foliage	100.0	0.7	41.4	42.0	-12.8	-13.0	20.2	20.5
E1	blue flower	96.2	1.8	52.6	53.5	8.9	8.2	-25.4	-24.1
F1	bluish green	98.2	1.2	68.5	69.1	-31.1	-31.2	-1.5	-0.5
A1	orange	99.2	1.2	59.1	59.6	34.9	34.3	52.0	51.1
B2	purplish blue	99.2	1.0	38.0	38.6	10.0	9.4	-43.7	-43.1
C2	moderate red	98.8	1.4	46.9	47.8	46.0	45.0	13.4	13.8
D2	purple	99.8	1.0	28.8	29.7	21.4	21.2	-21.2	-20.7
E2	yellow green	100.0	0.7	70.1	70.7	-23.0	-22.9	53.0	53.4
F2	orange yellow	99.5	1.1	68.7	69.3	18.1	17.4	62.8	62.4
A3	blue	100.0	0.6	27.8	28.2	11.6	11.2	-45.8	-46.0
B3	green	99.8	0.9	51.8	52.5	-36.4	-36.5	29.3	29.9
C3	red	100.0	0.8	38.2	38.9	51.0	50.8	21.8	22.1
D3	yellow	99.9	0.9	76.7	77.3	5.2	4.6	74.5	74.8
E3	magenta	97.2	2.2	47.5	48.7	47.0	46.0	-18.5	-16.8
F3	cyan	98.8	1.1	48.1	48.8	-19.9	-20.5	-26.6	-26.0
A4	white	79.4	2.5	93.3	93.8	0.6	-0.2	-2.9	-0.6
B4	neutral 8	87.7	1.8	78.4	79.0	0.8	0.3	-2.3	-0.7
C4	neutral 6.5	93.7	1.3	65.2	65.9	0.3	-0.1	-2.3	-1.3
D4	neutral 5	98.7	0.9	49.9	50.6	0.8	0.5	-1.8	-1.2
E4	neutral 3.5	100.0	0.6	35.1	35.6	0.2	0.1	-1.8	-1.5
F4	black	100.0	0.2	21.8	22.0	-0.6	-0.8	-1.0	-0.8
A5	paper white	78.2	2.6	94.7	95.2	0.6	-0.2	-3.5	-1.0
B5	Skin highlight L*=88	92.0	1.9	84.4	85.0	13.3	12.2	10.5	12.0
C5	Skin highlight L* =75	97.4	1.4	70.9	71.6	21.5	20.7	17.5	18.4
D5	Skin shadow L*=28	100.0	0.6	24.7	25.2	14.9	14.8	14.1	14.4
E5	Skin shadow L*=13	98.9	0.7	14.4	14.4	11.9	12.2	10.4	11.0
F5	Maximum Black	100.0	0.2	6.9	6.7	0.1	0.0	-0.9	-1.0

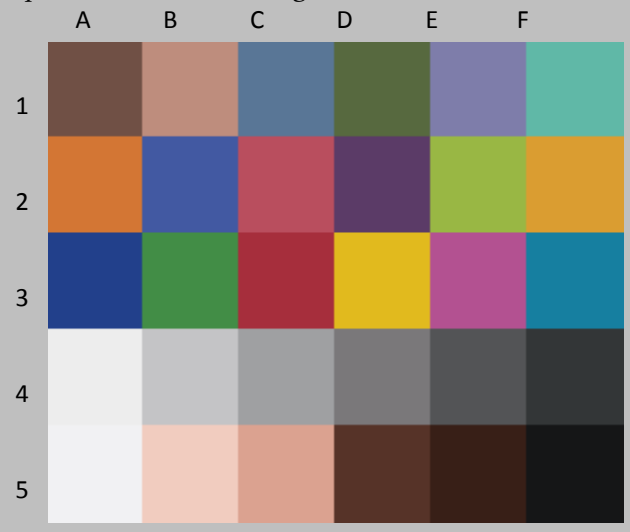
Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	96.9	98.0	1.1
Worst 10% (3 lowest scoring patches)	81.7	95.8	2.5

20 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure



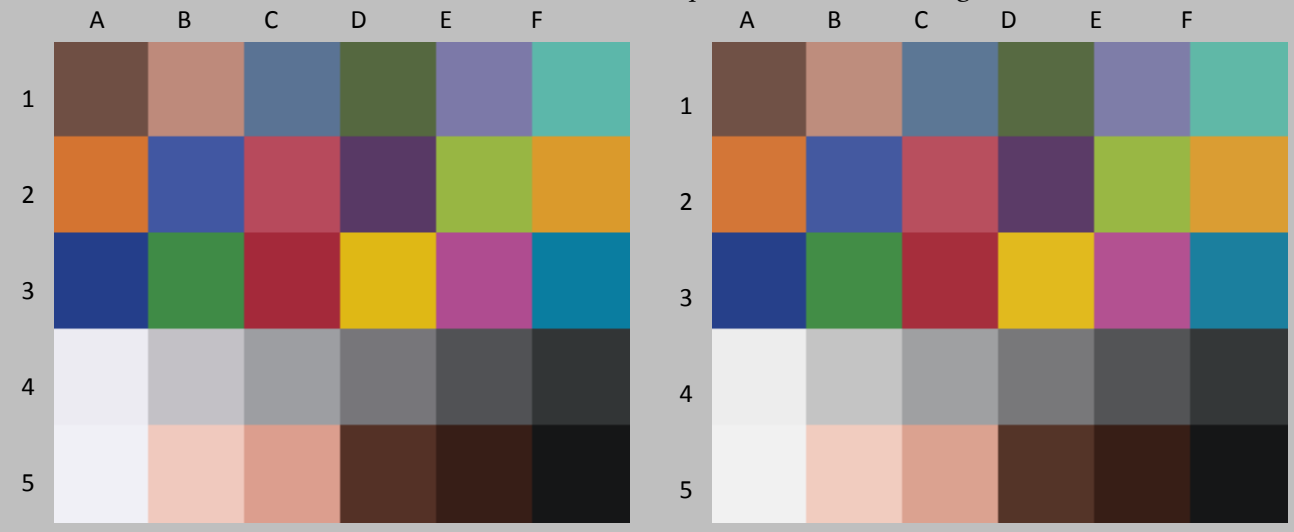
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	99.7	0.8	36.8	37.4	13.2	12.7	12.0	12.3
B1	Light Skin	96.9	1.5	62.4	63.2	19.1	18.1	15.6	16.4
C1	Blue sky	97.3	1.4	47.5	48.4	-3.1	-3.7	-21.4	-20.5
D1	Foliage	100.0	0.7	41.4	42.1	-12.8	-12.9	20.2	20.5
E1	blue flower	96.1	1.8	52.6	53.6	8.9	8.2	-25.4	-24.0
F1	bluish green	97.9	1.4	68.5	69.2	-31.1	-31.1	-1.5	-0.4
A1	orange	98.4	1.6	59.1	59.7	34.9	34.1	52.0	50.7
B2	purplish blue	98.6	1.3	38.0	38.7	10.0	9.3	-43.7	-42.9
C2	moderate red	98.1	1.8	46.9	48.1	46.0	44.7	13.4	13.7
D2	purple	98.6	1.5	28.8	30.0	21.4	21.0	-21.2	-20.4
E2	yellow green	100.0	0.7	70.1	70.8	-23.0	-22.9	53.0	53.2
F2	orange yellow	99.1	1.4	68.7	69.5	18.1	17.2	62.8	62.2
A3	blue	100.0	0.8	27.8	28.4	11.6	11.1	-45.8	-45.7
B3	green	100.0	1.0	51.8	52.6	-36.4	-36.3	29.3	29.8
C3	red	99.8	1.1	38.2	39.2	51.0	50.4	21.8	21.8
D3	yellow	99.8	1.0	76.7	77.4	5.2	4.6	74.5	74.5
E3	magenta	96.4	2.7	47.5	48.9	47.0	45.8	-18.5	-16.5
F3	cyan	98.3	1.4	48.1	49.0	-19.9	-20.5	-26.6	-25.8
A4	white	77.9	2.7	93.3	93.9	0.6	-0.2	-2.9	-0.5
B4	neutral 8	86.2	1.9	78.4	79.1	0.8	0.3	-2.3	-0.5
C4	neutral 6.5	91.7	1.5	65.2	65.9	0.3	-0.1	-2.3	-1.1
D4	neutral 5	96.7	1.1	49.9	50.7	0.8	0.5	-1.8	-1.0
E4	neutral 3.5	99.3	0.9	35.1	35.7	0.2	0.0	-1.8	-1.3
F4	black	100.0	0.5	21.8	22.2	-0.6	-0.7	-1.0	-0.7
A5	paper white	76.2	2.8	94.7	95.2	0.6	-0.3	-3.5	-0.9
B5	Skin highlight L*=88	91.2	2.1	84.4	85.1	13.3	12.0	10.5	12.1
C5	Skin highlight L* =75	96.9	1.6	70.9	71.8	21.5	20.5	17.5	18.4
D5	Skin shadow L*=28	100.0	0.9	24.7	25.5	14.9	14.5	14.1	14.3
E5	Skin shadow L*=13	100.0	0.6	14.4	14.8	11.9	11.9	10.4	10.8
F5	Maximum Black	100.0	0.2	6.9	7.1	0.1	0.0	-0.9	-0.9

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	96.4	97.6	1.4
Worst 10% (3 lowest scoring patches)	80.1	94.7	2.7

30 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

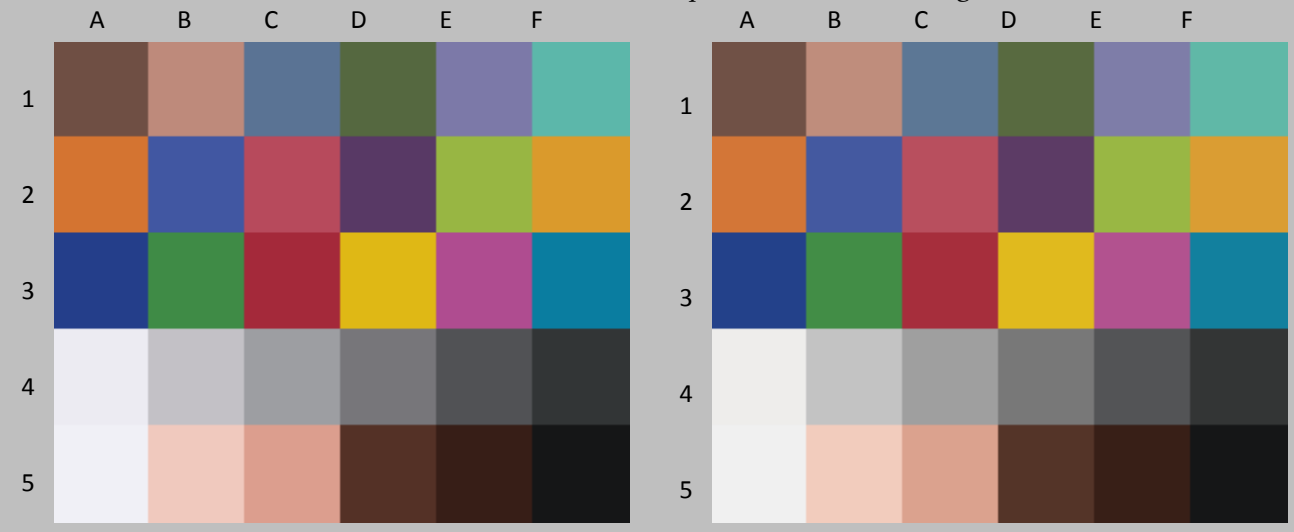
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	98.6	1.1	36.8	37.6	13.2	12.4	12.0	12.2
B1	Light Skin	96.6	1.6	62.4	63.2	19.1	18.0	15.6	16.5
C1	Blue sky	95.2	1.8	47.5	48.5	-3.1	-3.7	-21.4	-20.0
D1	Foliage	100.0	0.9	41.4	42.3	-12.8	-12.6	20.2	20.3
E1	blue flower	93.3	2.6	52.6	53.8	8.9	7.9	-25.4	-23.3
F1	bluish green	97.0	1.6	68.5	69.2	-31.1	-31.0	-1.5	-0.1
A1	orange	97.2	2.4	59.1	59.8	34.9	33.7	52.0	50.0
B2	purplish blue	97.1	2.0	38.0	38.9	10.0	8.9	-43.7	-42.3
C2	moderate red	97.2	2.3	46.9	48.3	46.0	44.2	13.4	13.6
D2	purple	97.0	2.0	28.8	30.3	21.4	20.7	-21.2	-20.0
E2	yellow green	100.0	0.7	70.1	70.7	-23.0	-22.8	53.0	53.0
F2	orange yellow	98.1	1.9	68.7	69.5	18.1	17.1	62.8	61.5
A3	blue	98.6	1.4	27.8	28.6	11.6	10.7	-45.8	-45.1
B3	green	100.0	1.0	51.8	52.7	-36.4	-36.1	29.3	29.7
C3	red	98.9	1.6	38.2	39.4	51.0	50.0	21.8	21.5
D3	yellow	99.6	1.1	76.7	77.4	5.2	4.5	74.5	74.1
E3	magenta	95.3	3.3	47.5	49.1	47.0	45.5	-18.5	-16.0
F3	cyan	97.4	1.6	48.1	49.0	-19.9	-20.5	-26.6	-25.4
A4	white	73.2	3.1	93.3	93.7	0.6	-0.2	-2.9	0.0
B4	neutral 8	82.5	2.3	78.4	79.1	0.8	0.3	-2.3	-0.2
C4	neutral 6.5	88.6	1.7	65.2	65.9	0.3	-0.1	-2.3	-0.8
D4	neutral 5	93.8	1.4	49.9	50.7	0.8	0.5	-1.8	-0.7
E4	neutral 3.5	97.1	1.1	35.1	35.9	0.2	0.0	-1.8	-1.1
F4	black	100.0	0.9	21.8	22.6	-0.6	-0.8	-1.0	-0.5
A5	paper white	71.7	3.2	94.7	95.1	0.6	-0.3	-3.5	-0.4
B5	Skin highlight L*=88	89.8	2.3	84.4	85.1	13.3	11.9	10.5	12.3
C5	Skin highlight L* =75	96.4	1.8	70.9	71.9	21.5	20.3	17.5	18.4
D5	Skin shadow L*=28	99.7	1.0	24.7	25.6	14.9	14.4	14.1	14.3
E5	Skin shadow L*=13	98.2	0.8	14.4	14.7	11.9	11.9	10.4	11.2
F5	Maximum Black	100.0	0.1	6.9	6.9	0.1	0.1	-0.9	-0.9

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	94.9	97.2	1.7
Worst 10% (3 lowest scoring patches)	75.8	93.9	3.2

40 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

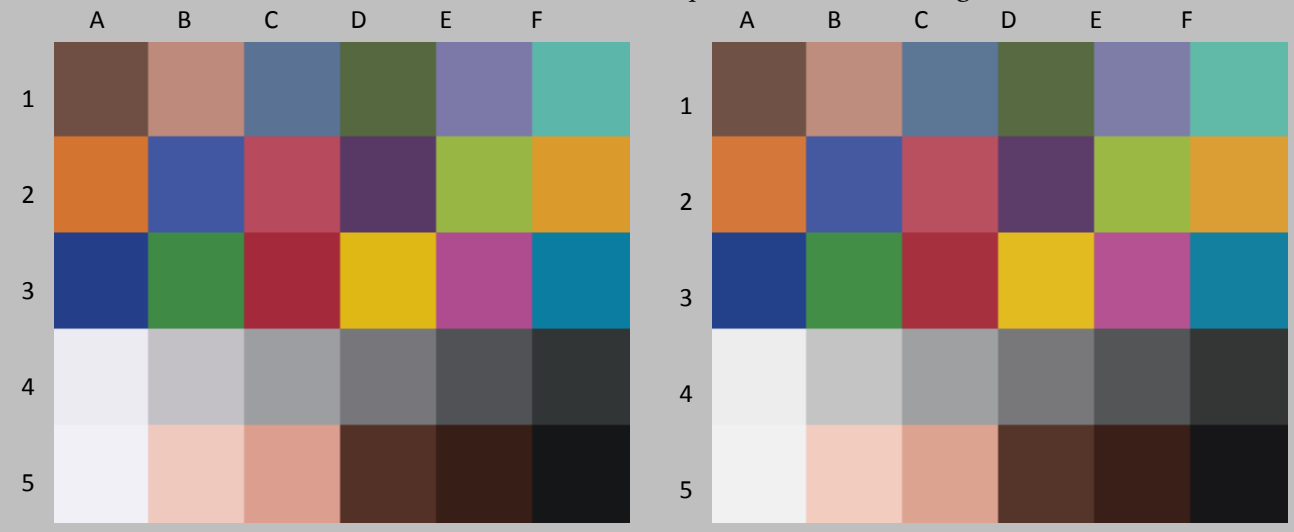
Colors After light exposure

Patch #	Description	I* Color	ΔE	L* Before	L* After	a* Before	a* After	b* Before	b* After
A1	Dark Skin	97.6	1.2	36.8	37.6	13.2	12.3	12.0	12.3
B1	Light Skin	95.5	1.8	62.4	63.2	19.1	17.9	15.6	16.7
C1	Blue sky	92.9	2.3	47.5	48.5	-3.1	-4.0	-21.4	-19.6
D1	Foliage	100.0	0.8	41.4	42.2	-12.8	-12.7	20.2	20.5
E1	blue flower	91.2	3.1	52.6	53.9	8.9	7.7	-25.4	-22.8
F1	bluish green	95.5	2.0	68.5	69.2	-31.1	-31.1	-1.5	0.4
A1	orange	97.0	2.5	59.1	59.8	34.9	33.7	52.0	50.0
B2	purplish blue	95.9	2.5	38.0	38.8	10.0	8.6	-43.7	-41.8
C2	moderate red	96.6	2.6	46.9	48.3	46.0	43.9	13.4	13.8
D2	purple	95.2	2.5	28.8	30.4	21.4	20.5	-21.2	-19.5
E2	yellow green	100.0	0.6	70.1	70.6	-23.0	-22.7	53.0	53.0
F2	orange yellow	98.2	1.8	68.7	69.4	18.1	17.1	62.8	61.5
A3	blue	97.5	1.8	27.8	28.5	11.6	10.3	-45.8	-44.7
B3	green	99.8	1.0	51.8	52.5	-36.4	-35.9	29.3	29.7
C3	red	98.6	1.7	38.2	39.3	51.0	49.8	21.8	21.6
D3	yellow	99.5	1.1	76.7	77.3	5.2	4.5	74.5	74.0
E3	magenta	94.2	3.7	47.5	49.0	47.0	45.5	-18.5	-15.4
F3	cyan	95.9	2.0	48.1	48.9	-19.9	-20.7	-26.6	-25.0
A4	white	66.2	3.7	93.3	93.6	0.6	-0.4	-2.9	0.7
B4	neutral 8	76.8	2.7	78.4	78.8	0.8	0.2	-2.3	0.4
C4	neutral 6.5	84.5	2.0	65.2	65.7	0.3	-0.1	-2.3	-0.4
D4	neutral 5	90.7	1.5	49.9	50.5	0.8	0.4	-1.8	-0.4
E4	neutral 3.5	95.1	1.1	35.1	35.7	0.2	-0.1	-1.8	-0.9
F4	black	99.7	0.6	21.8	22.1	-0.6	-0.8	-1.0	-0.5
A5	paper white	63.9	3.9	94.7	94.9	0.6	-0.3	-3.5	0.3
B5	Skin highlight L*=88	87.4	2.7	84.4	85.0	13.3	11.8	10.5	12.7
C5	Skin highlight L* =75	95.3	2.0	70.9	71.8	21.5	20.1	17.5	18.7
D5	Skin shadow L*=28	98.3	1.3	24.7	25.6	14.9	14.1	14.1	14.0
E5	Skin shadow L*=13	98.9	0.8	14.4	14.9	11.9	11.7	10.4	11.0
F5	Maximum Black	100.0	0.3	6.9	7.2	0.1	0.1	-0.9	-0.8

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	93.3	96.7	1.9
Worst 10% (3 lowest scoring patches)	69.0	93.1	3.8

50 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

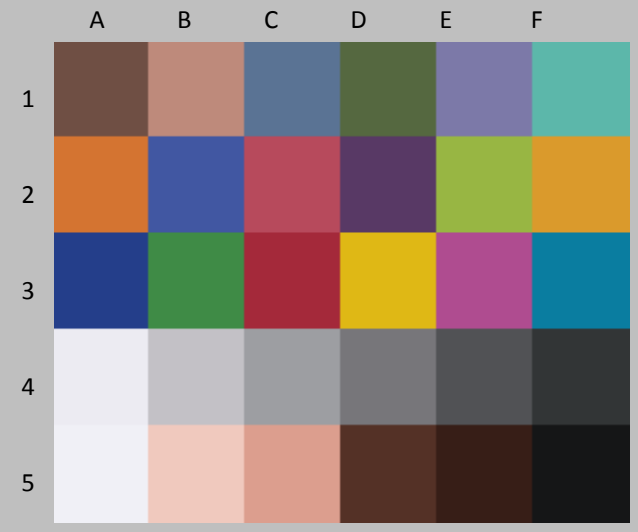
Colors After light exposure

Patch #	Description	I* Color	ΔE	L* Before	L* After	a* Before	a* After	b* Before	b* After
A1	Dark Skin	97.2	1.4	36.8	37.8	13.2	12.2	12.0	12.1
B1	Light Skin	95.8	1.8	62.4	63.3	19.1	17.8	15.6	16.4
C1	Blue sky	94.7	2.0	47.5	48.6	-3.1	-3.8	-21.4	-19.9
D1	Foliage	100.0	1.0	41.4	42.3	-12.8	-12.8	20.2	20.5
E1	blue flower	93.1	2.7	52.6	53.9	8.9	7.9	-25.4	-23.2
F1	bluish green	96.4	1.8	68.5	69.3	-31.1	-31.0	-1.5	0.1
A1	orange	96.3	2.9	59.1	59.9	34.9	33.6	52.0	49.5
B2	purplish blue	96.7	2.2	38.0	38.9	10.0	8.8	-43.7	-42.2
C2	moderate red	96.4	2.8	46.9	48.6	46.0	43.8	13.4	13.2
D2	purple	96.4	2.4	28.8	30.6	21.4	20.7	-21.2	-19.8
E2	yellow green	100.0	0.8	70.1	70.8	-23.0	-22.8	53.0	53.2
F2	orange yellow	97.7	2.2	68.7	69.6	18.1	16.9	62.8	61.3
A3	blue	98.2	1.6	27.8	28.6	11.6	10.5	-45.8	-45.0
B3	green	99.7	1.2	51.8	52.8	-36.4	-36.0	29.3	29.8
C3	red	98.2	2.1	38.2	39.6	51.0	49.7	21.8	21.0
D3	yellow	99.5	1.2	76.7	77.5	5.2	4.4	74.5	74.2
E3	magenta	94.7	3.6	47.5	49.3	47.0	45.5	-18.5	-15.7
F3	cyan	96.8	1.9	48.1	49.2	-19.9	-20.6	-26.6	-25.3
A4	white	71.6	3.2	93.3	93.9	0.6	-0.3	-2.9	0.2
B4	neutral 8	80.5	2.4	78.4	79.1	0.8	0.3	-2.3	0.0
C4	neutral 6.5	87.1	1.9	65.2	66.0	0.3	-0.1	-2.3	-0.6
D4	neutral 5	92.3	1.5	49.9	50.8	0.8	0.4	-1.8	-0.6
E4	neutral 3.5	95.3	1.3	35.1	35.9	0.2	-0.1	-1.8	-0.9
F4	black	99.5	0.8	21.8	22.4	-0.6	-0.8	-1.0	-0.5
A5	paper white	69.6	3.4	94.7	95.2	0.6	-0.3	-3.5	-0.2
B5	Skin highlight L*=88	89.4	2.4	84.4	85.3	13.3	11.7	10.5	12.2
C5	Skin highlight L* =75	95.5	2.1	70.9	72.1	21.5	20.0	17.5	18.3
D5	Skin shadow L*=28	98.0	1.5	24.7	25.9	14.9	14.0	14.1	14.1
E5	Skin shadow L*=13	98.8	1.1	14.4	15.2	11.9	11.5	10.4	11.0
F5	Maximum Black	100.0	0.5	6.9	7.4	0.1	0.1	-0.9	-0.7

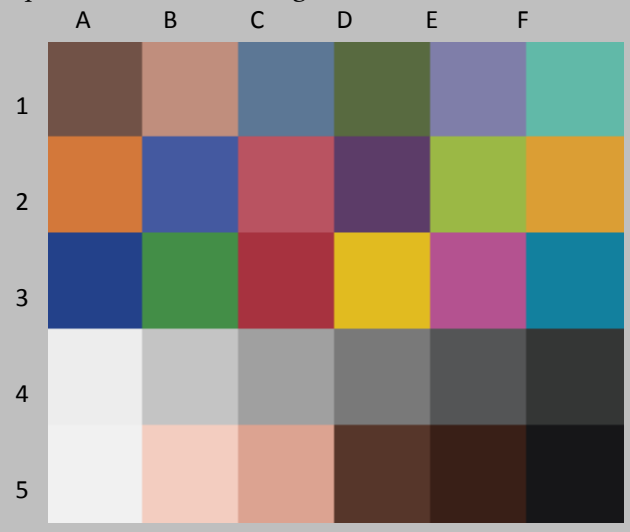
Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	94.2	96.6	1.9
Worst 10% (3 lowest scoring patches)	73.9	92.1	3.4

60 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure



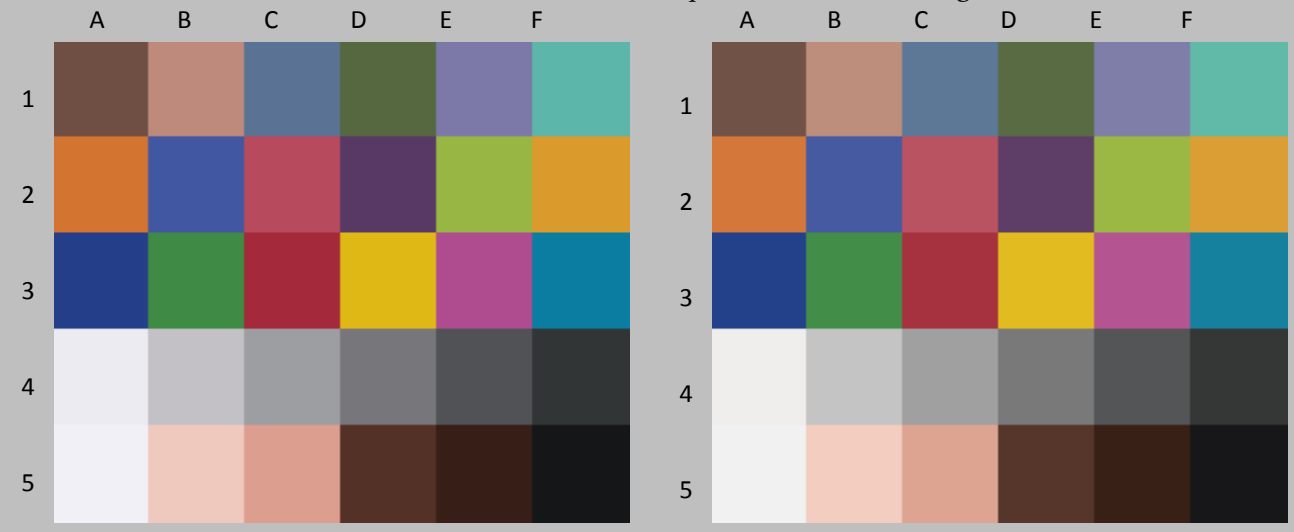
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	96.3	1.6	36.8	37.9	13.2	12.0	12.0	12.1
B1	Light Skin	94.8	2.1	62.4	63.5	19.1	17.5	15.6	16.5
C1	Blue sky	93.7	2.2	47.5	48.7	-3.1	-3.8	-21.4	-19.7
D1	Foliage	100.0	1.0	41.4	42.4	-12.8	-12.7	20.2	20.5
E1	blue flower	92.1	3.0	52.6	54.1	8.9	7.9	-25.4	-23.0
F1	bluish green	96.0	1.9	68.5	69.3	-31.1	-30.9	-1.5	0.2
A1	orange	95.7	3.3	59.1	60.0	34.9	33.4	52.0	49.2
B2	purplish blue	96.2	2.4	38.0	39.0	10.0	8.7	-43.7	-42.0
C2	moderate red	95.7	3.3	46.9	48.9	46.0	43.5	13.4	13.2
D2	purple	95.5	2.7	28.8	30.8	21.4	20.6	-21.2	-19.5
E2	yellow green	100.0	0.9	70.1	70.9	-23.0	-22.7	53.0	53.1
F2	orange yellow	97.4	2.5	68.7	69.8	18.1	16.8	62.8	61.1
A3	blue	97.9	1.8	27.8	28.7	11.6	10.4	-45.8	-44.9
B3	green	99.6	1.3	51.8	52.8	-36.4	-35.9	29.3	29.8
C3	red	97.6	2.4	38.2	39.9	51.0	49.5	21.8	20.9
D3	yellow	99.2	1.5	76.7	77.6	5.2	4.3	74.5	73.9
E3	magenta	94.3	3.9	47.5	49.4	47.0	45.5	-18.5	-15.4
F3	cyan	96.4	2.0	48.1	49.2	-19.9	-20.6	-26.6	-25.1
A4	white	69.3	3.5	93.3	93.9	0.6	-0.3	-2.9	0.4
B4	neutral 8	78.9	2.6	78.4	79.1	0.8	0.3	-2.3	0.2
C4	neutral 6.5	85.9	2.0	65.2	66.0	0.3	-0.1	-2.3	-0.5
D4	neutral 5	91.1	1.6	49.9	50.8	0.8	0.5	-1.8	-0.4
E4	neutral 3.5	94.7	1.4	35.1	36.0	0.2	0.0	-1.8	-0.8
F4	black	98.3	0.8	21.8	22.4	-0.6	-0.8	-1.0	-0.3
A5	paper white	67.5	3.6	94.7	95.2	0.6	-0.3	-3.5	0.0
B5	Skin highlight L*=88	88.5	2.6	84.4	85.4	13.3	11.6	10.5	12.3
C5	Skin highlight L* =75	94.9	2.3	70.9	72.3	21.5	19.8	17.5	18.3
D5	Skin shadow L*=28	97.0	1.8	24.7	26.1	14.9	13.8	14.1	13.9
E5	Skin shadow L*=13	98.0	1.2	14.4	15.2	11.9	11.5	10.4	11.1
F5	Maximum Black	100.0	0.6	6.9	7.5	0.1	0.1	-0.9	-0.7

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	93.4	96.1	2.1
Worst 10% (3 lowest scoring patches)	71.9	91.2	3.6

70 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

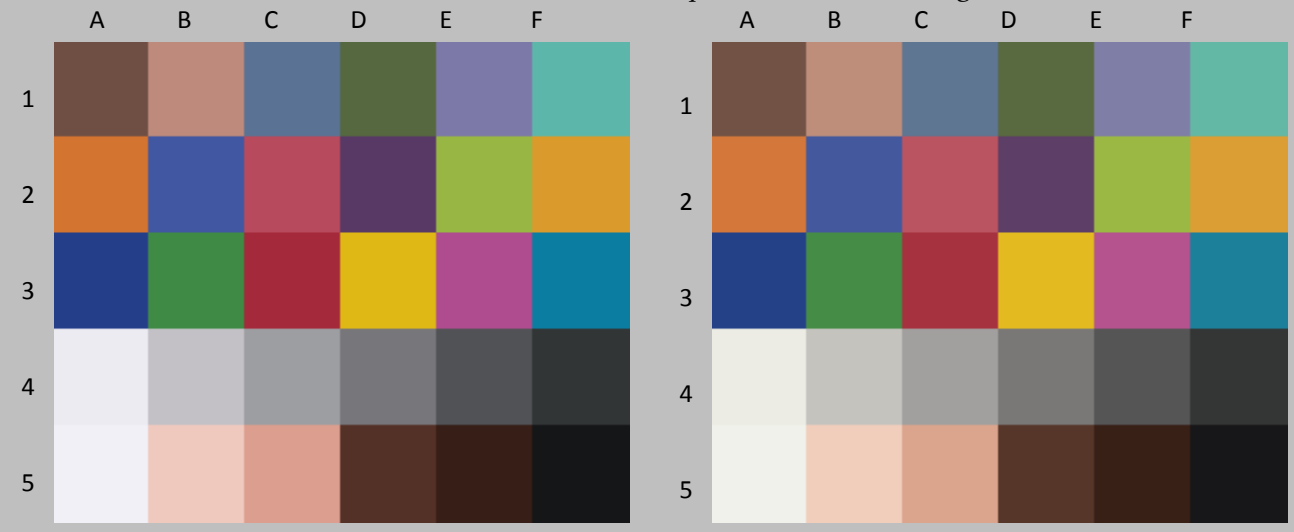
Colors After light exposure

Patch #	Description	I* Color	ΔE	L* Before	L* After	a* Before	a* After	b* Before	b* After
A1	Dark Skin	95.7	1.8	36.8	38.1	13.2	11.9	12.0	12.1
B1	Light Skin	94.4	2.3	62.4	63.6	19.1	17.4	15.6	16.5
C1	Blue sky	92.9	2.5	47.5	48.9	-3.1	-3.9	-21.4	-19.5
D1	Foliage	100.0	1.2	41.4	42.6	-12.8	-12.6	20.2	20.4
E1	blue flower	90.9	3.4	52.6	54.3	8.9	7.8	-25.4	-22.7
F1	bluish green	95.7	2.1	68.5	69.4	-31.1	-30.9	-1.5	0.3
A1	orange	95.2	3.7	59.1	60.2	34.9	33.2	52.0	48.9
B2	purplish blue	95.8	2.7	38.0	39.1	10.0	8.6	-43.7	-41.8
C2	moderate red	95.3	3.6	46.9	49.1	46.0	43.3	13.4	13.2
D2	purple	95.0	2.9	28.8	31.0	21.4	20.6	-21.2	-19.3
E2	yellow green	100.0	0.9	70.1	71.0	-23.0	-22.7	53.0	52.9
F2	orange yellow	96.9	2.8	68.7	69.9	18.1	16.7	62.8	60.7
A3	blue	97.5	1.9	27.8	28.8	11.6	10.3	-45.8	-44.7
B3	green	99.4	1.5	51.8	53.0	-36.4	-35.6	29.3	29.5
C3	red	97.2	2.8	38.2	40.1	51.0	49.3	21.8	20.7
D3	yellow	99.1	1.6	76.7	77.8	5.2	4.3	74.5	73.8
E3	magenta	93.9	4.1	47.5	49.6	47.0	45.5	-18.5	-15.2
F3	cyan	96.0	2.2	48.1	49.3	-19.9	-20.6	-26.6	-24.9
A4	white	67.0	3.7	93.3	93.9	0.6	-0.3	-2.9	0.6
B4	neutral 8	77.3	2.8	78.4	79.2	0.8	0.3	-2.3	0.4
C4	neutral 6.5	84.6	2.1	65.2	66.1	0.3	-0.1	-2.3	-0.4
D4	neutral 5	90.5	1.7	49.9	50.9	0.8	0.4	-1.8	-0.4
E4	neutral 3.5	94.0	1.5	35.1	36.1	0.2	-0.1	-1.8	-0.8
F4	black	98.5	1.0	21.8	22.6	-0.6	-0.8	-1.0	-0.4
A5	paper white	65.0	3.9	94.7	95.3	0.6	-0.3	-3.5	0.2
B5	Skin highlight L*=88	87.5	2.8	84.4	85.5	13.3	11.5	10.5	12.4
C5	Skin highlight L* =75	94.2	2.6	70.9	72.4	21.5	19.6	17.5	18.4
D5	Skin shadow L*=28	96.3	2.1	24.7	26.4	14.9	13.7	14.1	13.8
E5	Skin shadow L*=13	98.6	1.3	14.4	15.4	11.9	11.4	10.4	10.9
F5	Maximum Black	100.0	0.9	6.9	7.8	0.1	0.1	-0.9	-0.7

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	92.8	95.7	2.3
Worst 10% (3 lowest scoring patches)	69.8	90.3	3.9

80 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

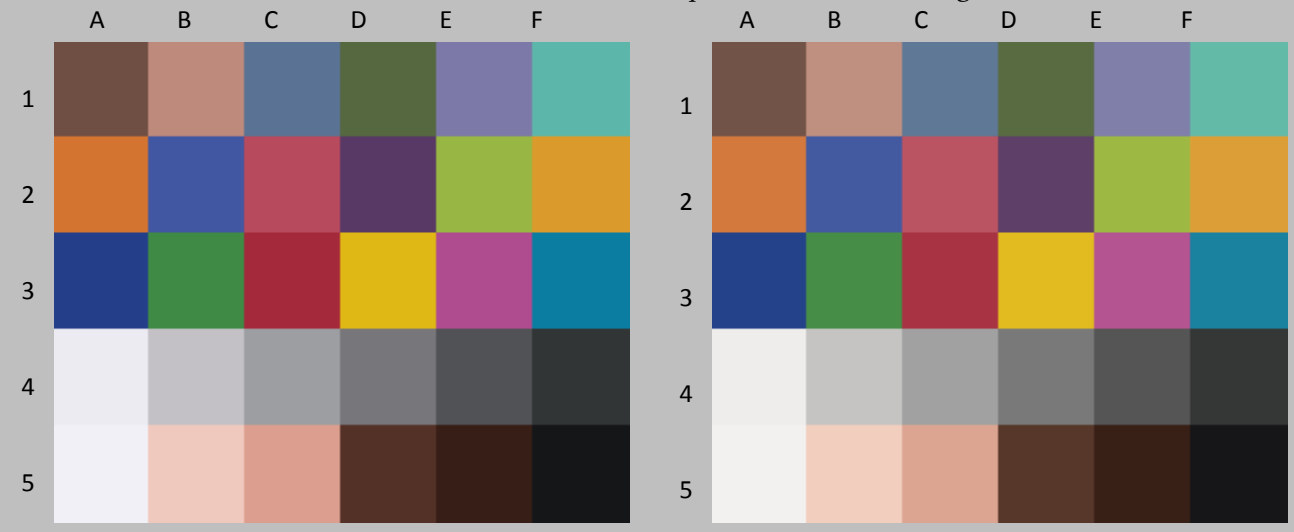
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	94.2	2.1	36.8	38.2	13.2	11.7	12.0	12.6
B1	Light Skin	90.5	3.1	62.4	63.5	19.1	17.3	15.6	17.9
C1	Blue sky	85.9	3.7	47.5	48.6	-3.1	-4.2	-21.4	-18.1
D1	Foliage	99.5	1.2	41.4	42.4	-12.8	-12.5	20.2	20.7
E1	blue flower	83.8	5.1	52.6	54.0	8.9	7.3	-25.4	-20.8
F1	bluish green	90.4	3.5	68.5	69.1	-31.1	-31.0	-1.5	2.0
A1	orange	95.4	3.5	59.1	60.2	34.9	33.2	52.0	49.1
B2	purplish blue	91.1	4.6	38.0	38.9	10.0	7.6	-43.7	-39.9
C2	moderate red	94.0	4.1	46.9	49.2	46.0	42.8	13.4	14.2
D2	purple	91.3	3.7	28.8	30.9	21.4	20.3	-21.2	-18.3
E2	yellow green	99.8	0.9	70.1	70.8	-23.0	-22.4	53.0	53.0
F2	orange yellow	96.9	2.8	68.7	69.8	18.1	16.8	62.8	60.7
A3	blue	93.6	3.6	27.8	28.7	11.6	9.3	-45.8	-43.1
B3	green	98.9	1.4	51.8	52.7	-36.4	-35.5	29.3	29.8
C3	red	97.1	2.8	38.2	40.1	51.0	49.0	21.8	21.4
D3	yellow	99.3	1.4	76.7	77.6	5.2	4.6	74.5	73.7
E3	magenta	90.2	5.8	47.5	49.5	47.0	45.0	-18.5	-13.4
F3	cyan	90.9	3.6	48.1	49.1	-19.9	-21.1	-26.6	-23.4
A4	white	35.7	6.6	93.3	93.4	0.6	-0.6	-2.9	3.6
B4	neutral 8	54.4	4.9	78.4	78.8	0.8	0.1	-2.3	2.5
C4	neutral 6.5	67.9	3.6	65.2	65.7	0.3	-0.3	-2.3	1.2
D4	neutral 5	78.9	2.6	49.9	50.7	0.8	0.3	-1.8	0.7
E4	neutral 3.5	86.9	2.0	35.1	36.0	0.2	-0.2	-1.8	-0.1
F4	black	94.5	1.2	21.8	22.4	-0.6	-0.8	-1.0	0.0
A5	paper white	34.3	6.7	94.7	94.8	0.6	-0.6	-3.5	3.2
B5	Skin highlight L*=88	77.1	4.4	84.4	85.2	13.3	11.3	10.5	14.4
C5	Skin highlight L* =75	90.6	3.3	70.9	72.1	21.5	19.4	17.5	19.8
D5	Skin shadow L*=28	95.3	2.3	24.7	26.4	14.9	13.5	14.1	13.9
E5	Skin shadow L*=13	98.1	1.3	14.4	15.5	11.9	11.3	10.4	10.9
F5	Maximum Black	100.0	1.2	6.9	8.0	0.1	0.2	-0.9	-0.7

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	86.6	95.2	3.2
Worst 10% (3 lowest scoring patches)	41.5	89.0	6.4

90 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

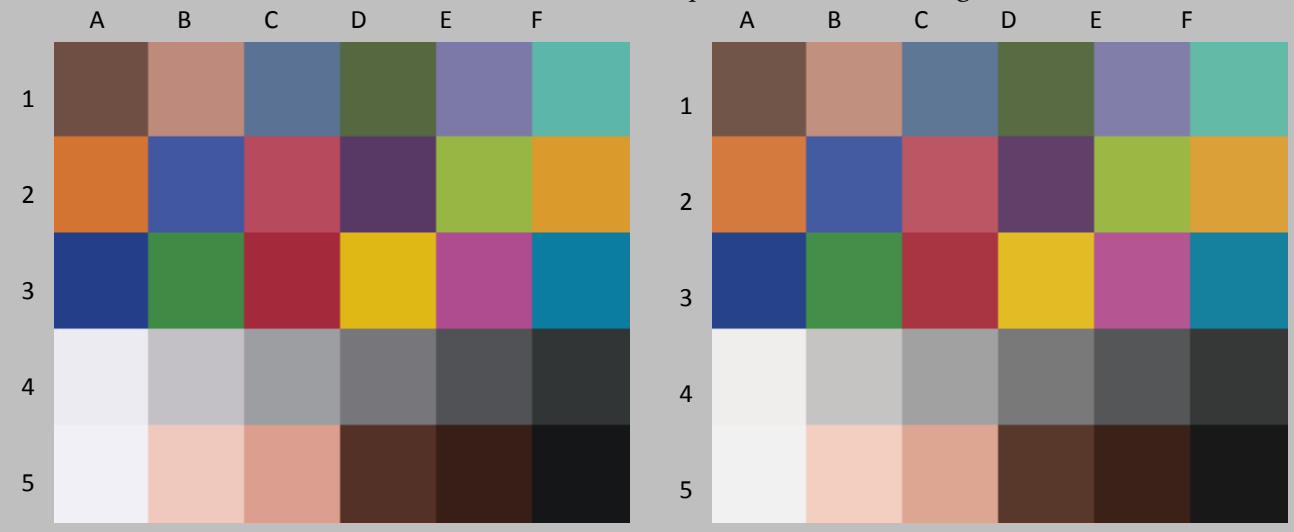
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	94.2	2.2	36.8	38.4	13.2	11.6	12.0	12.0
B1	Light Skin	93.4	2.6	62.4	63.9	19.1	17.1	15.6	16.4
C1	Blue sky	89.1	3.4	47.5	49.2	-3.1	-4.3	-21.4	-18.8
D1	Foliage	98.3	1.6	41.4	42.7	-12.8	-12.6	20.2	21.0
E1	blue flower	87.3	4.4	52.6	54.7	8.9	7.3	-25.4	-21.8
F1	bluish green	93.2	2.9	68.5	69.7	-31.1	-30.8	-1.5	1.1
A1	orange	94.2	4.3	59.1	60.3	34.9	33.1	52.0	48.3
B2	purplish blue	93.4	3.7	38.0	39.4	10.0	7.8	-43.7	-41.1
C2	moderate red	94.0	4.3	46.9	49.6	46.0	42.7	13.4	12.6
D2	purple	93.7	3.4	28.8	31.2	21.4	20.4	-21.2	-19.0
E2	yellow green	99.4	1.3	70.1	71.1	-23.0	-22.4	53.0	53.5
F2	orange yellow	96.5	3.1	68.7	70.0	18.1	16.6	62.8	60.5
A3	blue	95.4	2.9	27.8	29.0	11.6	9.5	-45.8	-44.2
B3	green	98.2	1.9	51.8	53.1	-36.4	-35.5	29.3	30.3
C3	red	96.2	3.4	38.2	40.4	51.0	49.1	21.8	20.1
D3	yellow	99.3	1.6	76.7	77.8	5.2	4.2	74.5	74.1
E3	magenta	93.0	4.6	47.5	49.8	47.0	45.3	-18.5	-14.8
F3	cyan	93.4	3.1	48.1	49.6	-19.9	-21.0	-26.6	-24.2
A4	white	61.1	4.2	93.3	93.9	0.6	-0.4	-2.9	1.2
B4	neutral 8	71.1	3.4	78.4	79.3	0.8	0.2	-2.3	0.9
C4	neutral 6.5	79.1	2.7	65.2	66.1	0.3	-0.2	-2.3	0.1
D4	neutral 5	85.4	2.2	49.9	51.0	0.8	0.3	-1.8	0.1
E4	neutral 3.5	90.3	1.8	35.1	36.2	0.2	-0.2	-1.8	-0.5
F4	black	95.5	1.3	21.8	22.8	-0.6	-0.9	-1.0	-0.1
A5	paper white	59.7	4.4	94.7	95.3	0.6	-0.4	-3.5	0.8
B5	Skin highlight L*=88	86.3	3.0	84.4	85.6	13.3	11.4	10.5	12.6
C5	Skin highlight L* =75	93.6	2.8	70.9	72.5	21.5	19.4	17.5	18.4
D5	Skin shadow L*=28	95.4	2.4	24.7	26.6	14.9	13.5	14.1	13.8
E5	Skin shadow L*=13	98.4	1.2	14.4	15.4	11.9	11.4	10.4	11.0
F5	Maximum Black	100.0	0.6	6.9	7.4	0.1	0.1	-0.9	-0.7

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	90.6	94.8	2.8
Worst 10% (3 lowest scoring patches)	64.0	88.8	4.5

100 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

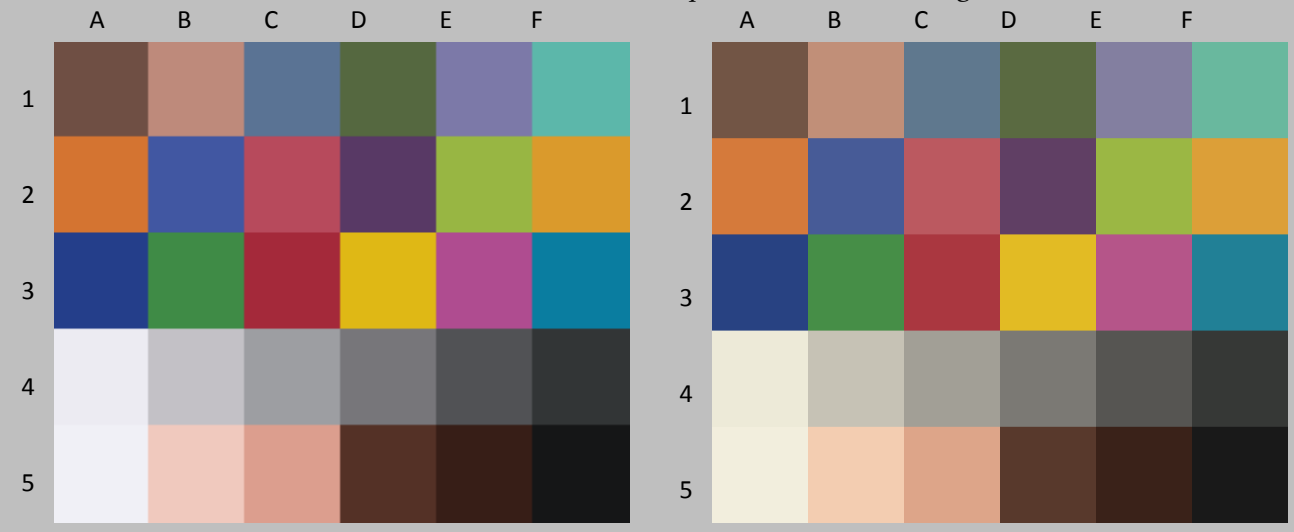
Colors After light exposure

				L*		a*		b*	
Patch #	Description	I* Color	ΔE	Before	After	Before	After	Before	After
A1	Dark Skin	92.8	2.6	36.8	38.6	13.2	11.4	12.0	11.8
B1	Light Skin	92.4	2.9	62.4	64.1	19.1	16.9	15.6	16.5
C1	Blue sky	91.4	2.9	47.5	49.2	-3.1	-3.8	-21.4	-19.2
D1	Foliage	100.0	1.5	41.4	42.9	-12.8	-12.5	20.2	20.3
E1	blue flower	89.1	4.0	52.6	54.6	8.9	7.7	-25.4	-22.2
F1	bluish green	95.0	2.4	68.5	69.6	-31.1	-30.6	-1.5	0.5
A1	orange	92.9	5.2	59.1	60.7	34.9	32.6	52.0	47.6
B2	purplish blue	94.3	3.4	38.0	39.4	10.0	8.3	-43.7	-41.2
C2	moderate red	93.0	5.0	46.9	50.2	46.0	42.3	13.4	12.7
D2	purple	93.2	3.8	28.8	31.6	21.4	20.6	-21.2	-18.8
E2	yellow green	99.9	1.2	70.1	71.2	-23.0	-22.6	53.0	52.5
F2	orange yellow	95.0	4.1	68.7	70.3	18.1	16.3	62.8	59.6
A3	blue	96.2	2.6	27.8	29.1	11.6	10.0	-45.8	-44.2
B3	green	99.4	1.6	51.8	53.2	-36.4	-35.6	29.3	29.5
C3	red	95.8	3.9	38.2	40.9	51.0	48.7	21.8	20.2
D3	yellow	98.4	2.2	76.7	78.0	5.2	4.0	74.5	73.3
E3	magenta	92.6	5.0	47.5	50.1	47.0	45.4	-18.5	-14.5
F3	cyan	95.0	2.6	48.1	49.6	-19.9	-20.5	-26.6	-24.6
A4	white	65.6	3.8	93.3	94.0	0.6	-0.3	-2.9	0.7
B4	neutral 8	74.8	3.0	78.4	79.3	0.8	0.3	-2.3	0.6
C4	neutral 6.5	81.9	2.4	65.2	66.2	0.3	-0.1	-2.3	-0.1
D4	neutral 5	87.7	2.1	49.9	51.1	0.8	0.4	-1.8	-0.1
E4	neutral 3.5	92.1	1.8	35.1	36.4	0.2	-0.1	-1.8	-0.6
F4	black	96.6	1.4	21.8	23.0	-0.6	-0.8	-1.0	-0.2
A5	paper white	63.7	4.0	94.7	95.3	0.6	-0.3	-3.5	0.4
B5	Skin highlight L*=88	86.7	3.1	84.4	85.8	13.3	11.2	10.5	12.3
C5	Skin highlight L* =75	92.5	3.2	70.9	72.8	21.5	19.1	17.5	18.3
D5	Skin shadow L*=28	93.4	3.0	24.7	27.0	14.9	13.2	14.1	13.6
E5	Skin shadow L*=13	97.3	1.9	14.4	16.0	11.9	11.0	10.4	10.7
F5	Maximum Black	100.0	1.2	6.9	8.1	0.1	0.2	-0.9	-0.8

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	91.3	93.9	2.9
Worst 10% (3 lowest scoring patches)	68.0	86.4	5.1

120 Megalux hours

HP Designjet Z3200 44", HP Vivera Pigment inkset for Z3200 series printers (uses HP 73 Chromatic Red), HP Pro Satin Photo Paper, no additional coating



Original Print Colors before light exposure

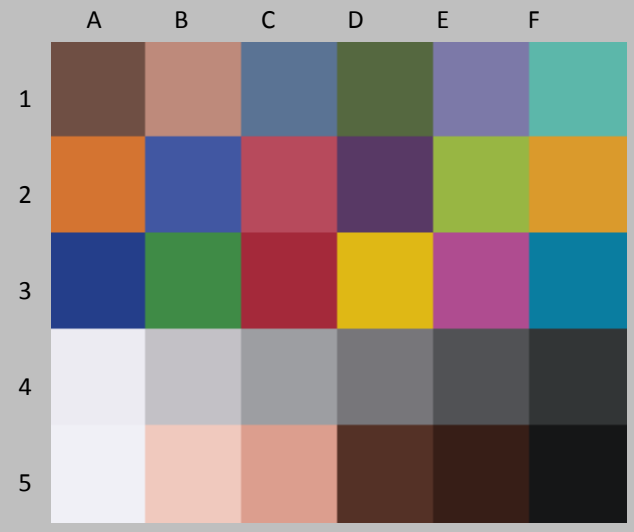
Colors After light exposure

Patch #	Description	I* Color	ΔE	L* Before	L* After	a* Before	a* After	b* Before	b* After
A1	Dark Skin	88.3	3.3	36.8	38.8	13.2	11.1	12.0	13.6
B1	Light Skin	80.3	5.6	62.4	64.0	19.1	16.5	15.6	20.3
C1	Blue sky	71.4	6.9	47.5	48.9	-3.1	-4.7	-21.4	-14.9
D1	Foliage	96.6	1.9	41.4	42.8	-12.8	-12.0	20.2	21.2
E1	blue flower	69.1	9.0	52.6	54.4	8.9	6.6	-25.4	-16.9
F1	bluish green	80.9	6.5	68.5	68.9	-31.1	-30.5	-1.5	4.9
A1	orange	94.3	4.4	59.1	60.6	34.9	32.6	52.0	48.6
B2	purplish blue	82.5	8.4	38.0	39.1	10.0	6.2	-43.7	-36.3
C2	moderate red	90.2	6.3	46.9	50.4	46.0	41.5	13.4	15.9
D2	purple	82.4	6.5	28.8	31.7	21.4	19.8	-21.2	-15.6
E2	yellow green	98.3	1.6	70.1	70.8	-23.0	-21.5	53.0	53.2
F2	orange yellow	95.9	3.5	68.7	70.0	18.1	16.7	62.8	60.0
A3	blue	86.9	6.7	27.8	28.8	11.6	7.8	-45.8	-40.3
B3	green	96.8	2.3	51.8	52.9	-36.4	-34.6	29.3	30.3
C3	red	95.3	4.4	38.2	41.4	51.0	48.0	21.8	22.2
D3	yellow	99.0	1.6	76.7	77.7	5.2	4.8	74.5	73.3
E3	magenta	82.6	9.6	47.5	50.0	47.0	44.5	-18.5	-9.5
F3	cyan	80.6	7.0	48.1	49.1	-19.9	-21.6	-26.6	-19.9
A4	white	(25.5)	12.4	93.3	92.7	0.6	-0.8	-2.9	9.4
B4	neutral 8	7.4	9.3	78.4	78.5	0.8	-0.1	-2.3	7.0
C4	neutral 6.5	32.2	7.0	65.2	65.7	0.3	-0.4	-2.3	4.6
D4	neutral 5	53.8	5.0	49.9	50.8	0.8	0.2	-1.8	3.1
E4	neutral 3.5	69.5	3.6	35.1	36.2	0.2	-0.2	-1.8	1.6
F4	black	84.9	2.3	21.8	23.0	-0.6	-0.8	-1.0	1.0
A5	paper white	(28.7)	12.7	94.7	94.0	0.6	-0.8	-3.5	9.2
B5	Skin highlight L*=88	53.0	8.5	84.4	84.9	13.3	10.9	10.5	18.6
C5	Skin highlight L* =75	79.8	6.3	70.9	72.4	21.5	18.6	17.5	22.9
D5	Skin shadow L*=28	92.4	3.3	24.7	27.3	14.9	12.9	14.1	14.3
E5	Skin shadow L*=13	96.6	2.2	14.4	16.3	11.9	10.9	10.4	10.7
F5	Maximum Black	100.0	1.9	6.9	8.7	0.1	0.3	-0.9	-0.5

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches	72.9	91.9	5.7
Worst 10% (3 lowest scoring patches)	(15.6)	83.0	11.6

140 Megalux hours

This test had been completed - no more updates



Original Print Colors before light exposure



Colors After light exposure

Patch #	Description	I* Color	ΔE	L* Before	L* After	a* Before	a* After	b* Before	b* After
A1	Dark Skin			36.8		13.2		12.0	
B1	Light Skin			62.4		19.1		15.6	
C1	Blue sky			47.5		-3.1		-21.4	
D1	Foliage			41.4		-12.8		20.2	
E1	blue flower			52.6		8.9		-25.4	
F1	bluish green			68.5		-31.1		-1.5	
A1	orange			59.1		34.9		52.0	
B2	purplish blue			38.0		10.0		-43.7	
C2	moderate red			46.9		46.0		13.4	
D2	purple			28.8		21.4		-21.2	
E2	yellow green			70.1		-23.0		53.0	
F2	orange yellow			68.7		18.1		62.8	
A3	blue			27.8		11.6		-45.8	
B3	green			51.8		-36.4		29.3	
C3	red			38.2		51.0		21.8	
D3	yellow			76.7		5.2		74.5	
E3	magenta			47.5		47.0		-18.5	
F3	cyan			48.1		-19.9		-26.6	
A4	white			93.3		0.6		-2.9	
B4	neutral 8			78.4		0.8		-2.3	
C4	neutral 6.5			65.2		0.3		-2.3	
D4	neutral 5			49.9		0.8		-1.8	
E4	neutral 3.5			35.1		0.2		-1.8	
F4	black			21.8		-0.6		-1.0	
A5	paper white			94.7		0.6		-3.5	
B5	Skin highlight L*=88			84.4		13.3		10.5	
C5	Skin highlight L* =75			70.9		21.5		17.5	
D5	Skin shadow L*=28			24.7		14.9		14.1	
E5	Skin shadow L*=13			14.4		11.9		10.4	
F5	Maximum Black			6.9		0.1		-0.9	

Summary Results	I* Color	I* tone	ΔE
Average Score for all patches			
Worst 10% (3 lowest scoring patches)			

160 Megalux hours